(12) UK Patent Application (19) GB (11) 2 265 586 (13) A

(43) Date of A publication 06.10.1993

(21) Application No 9213933.6

(22) Date of filing 30.06.1992

(30) Priority data
(31) 9207065 (32) 31.03.1992 (33) GB

(71) Applicant
Geoffrey Brian Hare
86 Broadoak Avenue, Enfield, Middx, EN3 6TX,
United Kingdom

(72) Inventor
Geoffrey Brian Hare

(74) Agent and/or Address for Service
Marks & Clerk
57–60 Lincoln's Inn Fields, London, WC2A 3LS,
United Kingdom

(51) INT CL[5]
B60C 11/24

(52) UK CL (Edition L)
B7C CKC

(56) Documents cited
GB 2243584 A GB 1400930 A GB 1262669 A
GB 0976967 A GB 0448223 A WO 91/04874 A1
US 4226274 A US 3516467 A

(58) Field of search
UK CL (Edition K) B7C CKC
INT CL[5] B60C
On-line databases: WPI

(54) Vehicle tyre with wear indicator

(57) A vehicle tyre 2 comprises an indicator 8 embedded in the body of the tyre to give warning of tread wear. The indicator 8 may comprise one or more layers of different colour(s) from that of the tread and may be in the form of axial, circumferential or oblique strips. The depth or thickness of the layers may be varied axially or circumferentially. Luminescent, eg fluorescent or phosphorescent material, may be used or the indicator may be formed of discrete particles. The indicator may be an implant in the tyre body to interact with a nearby detector to provide an electronic signal to indicate tread depth.

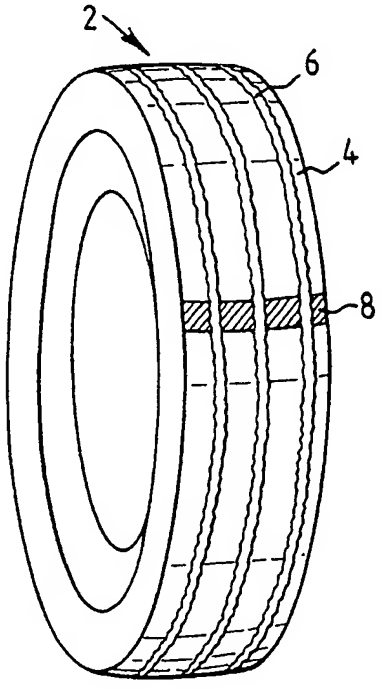

FIG.1

GB 2 265 586 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

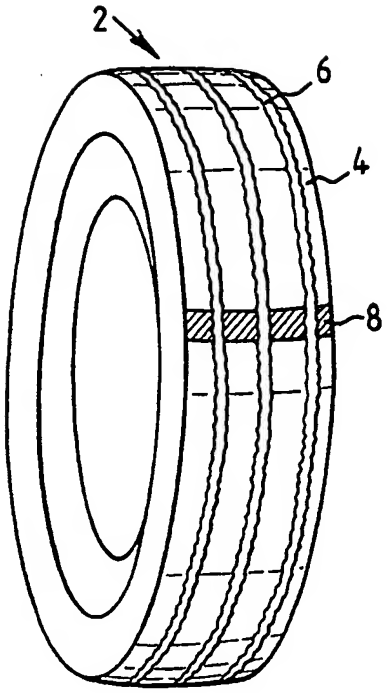

FIG.1

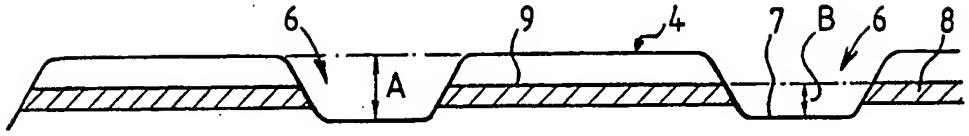

FIG.2

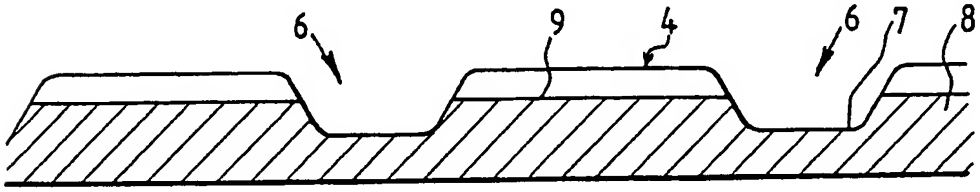

FIG.3

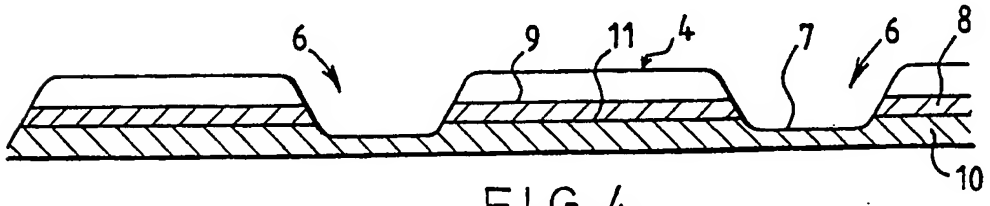

FIG.4

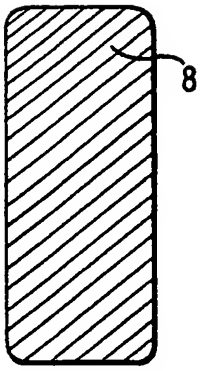

FIG 5

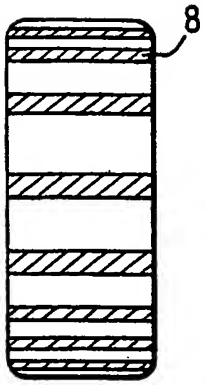

FIG.6

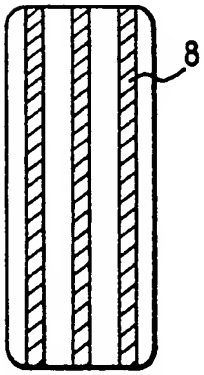

FIG.7

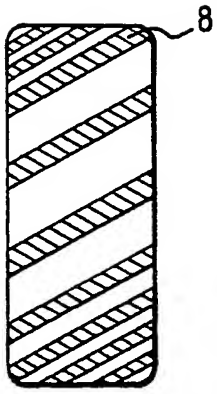

FIG.8

VEHICLE TYRE WITH WEAR INDICATOR

This invention relates to a vehicle tyre comprising means for indicating the degree of wear of the tyre tread.

As the tread on a vehicle tyre wears during use, the tyre will approach a condition where it is no longer safe to be used. Furthermore, in most countries the law provides that a tyre must be replaced before it becomes worn to the degree that it is unsafe.

Until now, the depth of vehicle tyre tread has been generally gauged by the use of some form of measurement device which is inserted into the recessed tread formation of the tyre. Once the measuring device is inserted, a simple scale allows the relative separation of the outer surface (as defined by the ground-contacting parts of the tread formation) and the inner surface (as defined by the base of the recessed portions of the tread) to be compared, thereby giving an indication of the depth of tread remaining on the tyre.

Although this method of tread measurement is simple, its accuracy is questionable and measurements can only be performed by direct measurement of the tyre in question

and only whilst the vehicle is stationary. Furthermore, tyres do not wear evenly over the whole of their surface area. This could be done, for example, to unevenly balanced wheels or as a result of the car having a specific braking point causing the wheels always to come to rest at a particular angular position. The above described known method of measurement will not account for variations in tread depth over the ground-addressing surface of the tyre unless it is performed repeatedly at various positions over that surface.

The present invention sets out to provide means for determining the depth of tread remaining on a tyre accurately and efficiently and with comparative ease. Furthermore, the invention sets out to provide a means for determining tread depth which allows the depth of tread remaining to be observed and even measured from a distance and in conditions of poor visibility and even. Furthermore, the present invention sets out to provide means for allowing the depth of tread remaining on a tyre fitted to a moving vehicle to be established.

According to the present invention there is provided a vehicle tyre comprising a tread formed on a ground-addressing surface thereof and indicator means implanted within the body of the tyre and beneath the said ground-addressing surface, the said indicator means being adapted to provide an indication of the depth of

tread remaining on the tyre when frictional erosion of the said tread causes the distance of separation between the indicator means and at least a part of the ground addressing surface to become reduced or causes the indicator means to become exposed.

In a preferred embodiment, the indicator means is adapted to become visible when frictional erosion of the said tread causes the indicator means to become exposed.

Preferably, the indicator means is in the form of a luminescent strip or layer, which may be fluorescent or phosphorescent.

The indicator means may be formed by a discrete layer or strip embedded in the tyre body. Alternatively, the indicator means may be formed by a particulate material embedded, with constant or varying distribution density, within the tyre body.

The indicator means may be configured to comprise a plurality of radially superposed layers.

Embodiments of the invention will now be described by way of example and with reference to the accompanying drawings in which: -

Figure 1 shows a vehicle tyre according to a first embodiment of the invention;

Figure 2 shows an enlarged cross-section through a portion of a ground-addressing surface of the tyre shown in Figure 1;

Figure 3 is a view corresponding to Figure 2 but relating to a second embodiment of the invention;

Figure 4 is a view corresponding to Figures 2 and 3 but showing a still further embodiment of the invention; and

Figures 5 to 8 are schematic views showing the arrangement of the indicator means within tyres according to a further four respective embodiments of the invention.

Figures 1 and 2 show a vehicle tyre 2 with a ground-contacting tread surface 4 and tread recesses 6.

An indicator means in the form of a transverse, localised strip 8 is moulded into the tyre 2, such that its outer surface 9 is located at a specified distance B from the base 7 of each tread recess 6.

The strip 8 is made from a material which reflects light. The material could merely be brightly coloured or possibly be a fluorescent material. Advantageously the material will be phosphorescent.

Referring to Figure 2, the distance A represents the tread depth, as defined by the depth of recesses 6, of a

tyre. Distance B will represent either a minimum legal tread depth or a tread depth at which the tyre can no longer be regarded as completely safe.

It may be preferred to make the distance B slightly greater than the minimum safe depth, in order that tyres will be replaced before they are likely to be unsafe.

As the tyre wears down, the depth A will decrease until it corresponds to depth B. When the depth of the tread becomes that of depth B, the outer surface 9 of strip 8 becomes exposed. Due to the highly visible nature of the strip, it will immediately be apparent that the tyre should be replaced. If the strip 8 is made from a phosphorescent material the strip will also be visible in the dark.

If this strip is sufficiently reflective or fluorescent, it will be possible for the police or other authorities to beam a light onto the tyres of passing vehicles at night-time. Although ambient lighting from street lamps or other vehicles could render the strip highly visible. Any illegal or unsafe tyres will then reflect light, thereby indicating that the vehicle is fitted with illegal or unsafe tyres. If the strip is made from a phosphorescent material, it would even at times be possible to view the strip without incident light, due to the strip's ability to 'glow' in the dark after

recent exposure to light (such as from a street lamp or vehicle head light for example).

The strip 8 shown in Figure 2 is of sufficient depth that it will for a prolonged period of time indicate the condition of the tyre. Furthermore, this strip has the advantage that it only occupies a small volume of the tyre and will not, therefore, significantly affect performance. However, it is conceivable that the strip could, eventually, wear through or even be removed by an unscrupulous user.

Figure 3 shows an alternative arrangement in which the strip 8 has a much greater depth. This has the advantage that it will not wear through and will not easily be removed without totally destroying the tyre.

Figure 4 shows a still further embodiment in which the tyre is provided with two discrete strips 8 and 10 at respectively different depths. By providing two strips in this manner, it is possible to indicate the degree of wear to a more gradual extent. For example, the upper strip 8 could be used to represent an early warning to the user or road authority that the tyre will soon need to be replaced. The strip 10 could in such an arrangement indicate that the tyre must be replaced. Alternatively, the strip 8 could be used to represent the minimum legal tread depth whilst the strip 10 could

be used to indicate that the tyre is dangerous. The two strips would, of course, be of different colours.

Figures 5 to 8 illustrate four possible configurations for the distribution of indicator means within the tyre.

Figure 5 shows a tyre in which indicator means 8 is a layer and is disposed beneath the entire ground-addressing surface of the tyre. Such an arrangement would be the most effective for indicating tyre wear, since it will show where a tyre has worn in isolated areas.

Figure 6 shows a series of indicator strips parallel to the axis of rotation of the tyre and each strip corresponds to the strip of the arrangement shown in Figure 1.

Figure 7 shows a series of circumferentially orientated strips and Figure 8 shows a series of strips skewed about the axis of rotation of the tyre.

In each case, the reflective strip or layer may be formed by a discrete strip or may be formed by impregnating the tyre at a specific depth with a particulate material which illustrates the desired light-reflecting or emitting properties.

Many further modifications will suggest themselves to the skilled addressee upon making reference to the foregoing description, which is given by way of example only, and which is not intended to limit the scope of the invention in any way.

For example, it may be desirable to vary the depth or thickness of the strip or layer 8 and/or 10 in the axial direction of the tyre in order to account for uneven distribution of frictional forces being experienced over the width of the ground-contacting surface of the tyre during use.

Furthermore, it may be desirable to incorporate a series of layers to indicate, on a gradual scale, the extent of wear on the tyre.

Alternatively, if the tyre were to be impregnated with particulate material, the density of particle distribution could be increased in the direction from the ground-addressing surface towards the axis of rotation, thereby providing an increased level of reflection and possibly luminescence as the tyre wears.

Alternatively, the depth of the layer could be varied with regard to circumferential location. One result of this is that the layer would initially appear as a thin, axially oriented strip. As the tyre wore down the

thickness of the strip, as measured in the circumferential direction, would gradually increase until, in the extreme case, the strip was no longer a strip, but a band encircling the entire circumference of the strip.

Although the above embodiments all relate to a visible strip, the invention can equally be applied to a magnetically or electrically-based indication system. In such a system, an implant is located within the body of the tyre and below the ground-addressing surface. In such an arrangement the implant interacts with a detector probe fitted to the vehicle and disposed in close proximity to the tyre surface. The tyre serves to insulate the implant from the probe. As the tyre wears, the insulation decreases and the probe generates a signal, the strength of which will vary with the degree of insulation afforded by the tyre.

Claims

1. A vehicle tyre comprising a tread formed on a ground-addressing surface thereof and indicator means implanted within the body of the tyre and beneath the said ground-addressing surface, the said indicator means being adapted to provide an indication of the depth of tread remaining on the tyre when frictional erosion of the said tread causes the distance of separation between the indicator means and at least a part of the ground-addressing surface to become reduced or causes the indicator means to become exposed.

2. A vehicle tyre according to claim 1, wherein the said indicator means is adapted to become visible when frictional erosion of the said tread causes the indicator means to become exposed.

3. A vehicle tyre according to claim 2, wherein the said indicator means is defined by a region of material having a different colour to that of the ground-addressing surface of the tyre.

4. A vehicle tyre according to claim 2 or 3, wherein the said indicator means is highly reflective in the visible spectrum.

5. A vehicle tyre according to claim 2, 3 or 4, wherein at least part of the said indicator means is made from a luminescent material.

6. A vehicle tyre according to claim 5, wherein at least some of the said luminescent material is fluorescent.

7. A vehicle tyre according to claim 5, wherein at least some of the said luminescent material is phosphorescent.

8. A vehicle tyre according to one of claims 2 to 7, wherein the said indicator means is in the form of a strip, orientated with its longitudinal axis parallel to the axis of rotation of the tyre.

9. A vehicle tyre according to one of claims 2 to 7, wherein the said indicator means is in the form of a strip orientated with its longitudinal axis parallel to the circumference of the tyre.

10. A vehicle tyre according to one of claims 2 to 7, wherein the said indicator means is in the form of a strip oriented with its longitudinal axis skewed with respect to the axis of rotation of the tyre.

11. A vehicle tyre according to one of claims 2 to 7, comprising a plurality of the said indicator means, each said indicator means according to one of claims 8 to 10.

12. A vehicle tyre according to one of claims 2 to 7, wherein the said indicator means comprises a layer encircling at least a portion of the circumference of the tyre.

13. A vehicle tyre according to any one of claims 2 to 12, wherein the said indicator means is formed by an aggregate of discrete particles embedded in the body of the tyre.

14. A vehicle tyre according to claim 13, wherein the distribution density of the particles varies with position in relation to the radial direction of the tyre.

15. A vehicle tyre according to any preceding claim, comprising more than one said indicator means located at respectively different depths in relation to the radial direction of the tyre.

16. A vehicle tyre according to any preceding claim, wherein the depth of the or each indicator means as, measured in relation to the radial direction of the tyre, varies in relation to the circumferential direction or the axial direction of the tyre.

17. A vehicle tyre according to claim 1 in combination with a sensor, wherein the said indicator means acts in combination with the sensor to generate an electronic signal generally indicative of the depth of tread remaining on the tyre.

18. A vehicle tyre according to claim 17, wherein the said sensor is mounted on a vehicle on which the tyre is mounted.

19. A vehicle tyre substantially as herein described with reference to any one of figures 1 to 8 of the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
9213933.6

Relevant Technical fields

(i) UK Cl (Edition K) B7C (CKC)

5 B60C

(ii) Int Cl (Edition)

Search Examiner
C J DUFF

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search
31 JULY 1992

Documents considered relevant following a search in respect of claims 1 TO 19

Category (see over)	Identity of document and relevant passages		Relevant to claim(s)
Y	GB 2243584 A	(ANTONIO) see page 3, lines 6-12; page 4, lines 17-22; page 5, lines 17-23	5, 6, 7
X,Y	GB 1400930	(PPG) see figure and page 1, lines 68-74; page 3, line 49-51, 71-75	X:1-4,9, 11,12,15, 16 Y: 5,6,7
X	GB 1262669	(BAXTER) see page 2, lines 19-65, 96-106; page 2, line 109 - page 3, line 52	1-4,9-13, 15
X	GB 976967	(ARTHUR) whole document	1-4,8,10, 11
X	GB 448223	(AMSLER) whole document	1-4,8-12, 15
X	WO 91/04874 A1	(LINDSAY) see Figure 71 and page 32, lines 8-12; page 36, line 21 - page 37, line 3	1, 17, 18
X	US 4226274	(AWAYA) whole document	1-4,8,9, 11, 12
X	US 3516467	(SIMS) whole document	1-4,9,11, 12,15,16

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

Published 1993 at The Patent Office, Concept House, Cardiff Road, Newport, Gwent NP9 1RH. Further copies may be obtained from Sales Branch, Unit 6, Nine Mile Point, Cwmfelinfach, Cross Keys, Newport, NP1 7HZ. Printed by Multiplex techniques ltd, St Mary Cray, Kent.